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David Fichtenberg
Ad-hoc Association of Parties Concerned About the Federal Communications Commission's Radiofrequency Health and Safety Rules
PO Box 7577
Olympia, WA 98507-7577

July 31, 1997

The Secretary
Federal Communications Commission
1919 M. Street N.W. Room 222
Washington, DC 20554

In the Matter of	)	ET-Docket No. 93-62
	)	and in this docket pertaining to:
Guidelines for Evaluating the Environmental	)	- Report and Order FCC 96-326
Effects of Radiofrequency Radiation	)	- First Memorandum of Understanding Order FCC 96-487

Ex Parte Comments Pertaining to ET-Docket 93-62 Regarding
PETITIONS FOR RECONSIDERATION of Commission Rule & Order FCC 96-326, and First Memorandum of Opinion and Order FCC 96-487

with original and 1 copy submitted to the Secretary of the Commission
in accordance with 47 CFR Sections 1.1202, 1.1203, and 1.1206(a)
7th Ex Parte Submission

Dear Mr. Secretary,

Enclosed please find an original and 1 copy of Exhibits #188-203 provided as an ex parte presentation pertaining to ET-Docket 93-62. Please assure these are put in the official record of this proceeding. The purpose of the presentation is to submit the enclosed exhibits which provide further support for the claims and requests in the Ad-Hoc Association Petitions for Reconsideration of FCC 96-326 and FCC 96-487. The presentation includes the accompanying letter to the Commission and the enclosed exhibits.

Thank you,

David Fichtenberg

David Fichtenberg July 31, 1997
Ad-hoc Association of Parties Concerned About the Federal Communications Commission's Radiofrequency Health and Safety Rules
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Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, DC 20554

In the Matter of	)	ET-Docket No. 93-62
	)	and in this docket pertaining to:
Guidelines for Evaluating the Environmental	)	- Report and Order FCC 96-326
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To: The Commission

Ex Parte Comments Pertaining to ET-Docket 93-62
Regarding
PETITIONS FOR RECONSIDERATION of Commission Rule & Order FCC 96-326, and First Memorandum of Opinion and Order FCC 96-487

with original and 1 copy dated July 31, 1997 and submitted to the Secretary of the Commission in accordance with ex parte submission rules in 47 CFR Section 1.1202, 1.1203, and 1.1206(a)

Submitted by the Ad-hoc Association of Parties Concerned About the Federal Communications Commission's Radiofrequency Health and Safety Rules, PO Box 7577, Olympia, WA 98507-7577

7th Ex Parte Submission

1. Introduction:

1.1 Appropriate submission of an ex parte presentation

The Ad-hoc Association of Parties Concerned About the Federal Communications Commission's Radiofrequency ("RF") Health and Safety Rules ("the Ad-Hoc Association") understands (i) that a Federal Communications Commission ("Commission") "Sunshine Agenda" period per 47 CFR Section 1.1202(f) and Section 1.1203 is not now in effect regarding ET-Docket 93-62; (ii) that administrative finality has not yet been decided upon concerning the Commission's responses to Petitions For Reconsideration that have been submitted in this proceeding; and that (iii) this proceeding permits ex parte presentations in accordance with 47 CFR §1.1202, 1.1203, and 1.1206(a), and in accordance with the April 8, 1993 Notice of Proposed Rule Making in ET-Docket 93-62, paragraph 30. Accordingly, the Ad-Hoc Association is properly making this ex parte submission.

1.2. The primary purpose of this submission is to provide documentation of original sources to assist in and to facilitate the verifying of claims and evaluating of requests in petitions for reconsideration made by the Ad-Hoc Association or other parties concerned that the Commission's rules in this proceeding may not be sufficiently protective of the public health and who have submitted petitions for reconsideration of FCC 96-326 and FCC 96-487.

To the extent that these source documents were not previously referenced in presentations to the Commission, these documents and reports became available and understood after the last opportunity for filing in this matter, and in any event, consideration of these documents significantly provides support to claims of changes needed for the public health and their consideration is in the public interest.

In this way, the Ad-Hoc Association is providing an opportunity for the Commission to review and pass upon the matters presented herein, and by so doing the Commission will have the opportunity of verifying claims which have been made and of considering any newly discovered evidence which support the requests in the Ad-Hoc Association FCC 96-326 and FCC 96-487 petitions, and in any event, even if the Commission finds otherwise, the Commission's consideration of these documents which verify and further support the Commission's approval of Ad-Hoc Association requests is in the public interest.

Should the Commission find it should make changes elsewhere in its rules based on the evidence herein, it is requested that it do so, and make any other modifications it finds to be just and proper to serve the public interest.

2. Documents presented may help expedite the Commission asking the federal health agencies to which the Commission has chosen to defer for advice on RF safety matters - noting that the Ad-Hoc Association has requested the Commission be consistent in its policy of seeking such advice.

2.1 This documentation is provided to the Chairman of the Commission in order to provide these documents to those to whom the Commission defers for guidance in evaluating the claims and requests made in petitions for reconsideration by the Ad-Hoc Association and other parties concerned that which the Commission's rules may not be sufficiently protective - thereby facilitating such evaluations. In addition, while the Commission may not be expert in RF safety

matters, it may nevertheless review these documents and see evidence which would appear to raise significant questions about claims of safety made by the Commission and which appear to support the claims and requests of the Ad-Hoc Association. Since the Commission has stated its policy is for its rules to be based upon recent scientific findings, therefore it is requested the Commission be consistent in its policies and have these documents and claims and requests of the Ad-Hoc Association critically reviewed by the federal health agencies from whom the Commission has sought guidance in developing its RF safety rules. This is because, as noted before in these proceedings, the Ad-Hoc Association believes in advising the Commission the federal health agencies have overlooked or misunderstood important findings or there is new information which will likely change the recommendations that the federal health agencies provided to the Commission. For these reasons, the enclosed documents should be reviewed by the Commission and critically reviewed and evaluated by the federal health agencies with regard to the extent these documents provide sufficient levels of evidence, if not conclusive proof, that provide important support to the claims and requests of the Ad-Hoc Association.

2.2 Enclosed please find Exhibits numbered **#188-203** which are provided to the Commission in accordance with #1.1, 1.2, and #2.1 above and are submitted per "fair use" provisions of copyright law in U.S. Title 17, and to be prudent should be presumed copyrighted materials unless stated or determined otherwise.

Respectfully Submitted,

David Fichtenberg

David Fichtenberg Dated: July 31, 1997
Spokesperson for the Ad-Hoc Association of Parties Concerned About the Federal Communications Commission's Radiofrequency Health and Safety Rules et al
PO Box 7577
Olympia, WA 98507-7577 Tel: (206) 722-8306

Enclosures: Exhibits numbered **#188-203**

E 188

CANCER INCIDENCE IN CENSUS TRACTS WITH BROADCASTING TOWERS IN HONOLULU, HAWAII

Prepared for:

City Council
City and County of Honolulu

Prepared by:

Environmental Epidemiology Program
State of Hawaii Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801

October 27, 1986

This report is submitted to the Honolulu City Council in partial fulfillment of Contract No. C17015.

For further information, contact Bruce S. Anderson, Ph.D., or Alden K. Henderson, M.P.H. at (808) 548-2076.

ACKNOWLEDGEMENTS

Funds to support this study were provided by the Honolulu City Council, Marilyn Bornhorst, Chairman. Data on cancer incidence was provided by staff of the Cancer Center of Hawaii and initially compiled by Karen Klein, M.P.H. The assistance of Loic LeMarchand, M.D., Cancer Research Center of Hawaii, F. DeWolfe Miller, Ph.D., University of Hawaii School of Public Health, Henri Minette, Dr.P.H., Consultant, Richard Melton, Honolulu City Council, L. Jack Kirkham, Research and Statistics Office, and staff of the Noise and Radiation Section, Hawaii State Department of Health, in reviewing this report is gratefully acknowledged.

TABLE OF CONTENTS

Summary

In May, 1984, the U.S. Environmental Protection Agency measured radiofrequency (RF) radiation at 21 sites near broadcasting towers in Honolulu. RF radiation levels at two rooftop sites surveyed exceeded the American National Standards Institute recommended standard of 1,000 uW/cm^2. Residents in nearby apartment buildings have reported radiation-associated shocks and burns, interference in their electronic equipment, and expressed concern of possible long-term health effects. Although investigators reported an increase in overall tumor incidence in rats exposed to RF radiation, evidence of its potential to cause cancer in humans is contradictory and inconclusive.

Data from the Hawaii Tumor Registry were used to determine the incidence of all cancers and leukemia in census tracts with broadcasting towers for the years 1979-1983. These rates were adjusted for age, sex, and race and compared to rates in selected census tracts without towers.

Altogether, the observed incidence rate of all cancers for males and females was found to be significantly higher in census tracts with broadcasting towers than the expected rate ($P<.01$) after adjusting for age and race. However, the study design utilized does not allow for drawing a cause-and-effect relationship between cancer incidence and RF radiation exposure. Data on personal exposures and other factors which affect cancer incidence (e.g., smoking, diet, and occupational history) were not available. Incidence rates for leukemia were not significantly higher ($P>.01$) than expected during this period.

Further epidemiologic studies of high-risk populations where exposure may be more accurately assessed and confounding effects can be adequately controlled are necessary to determine possible non-thermal health risks associated with RF radiation. It is recommended that an interim standard for public exposure to RF radiation be adopted to protect the public health. A standard can be an effective regulatory tool if appropriate funding and resources for monitoring and enforcement are made available.

INTRODUCTION

Background

Without special permits, Honolulu's zoning ordinances do not allow commercial broadcasting towers to be constructed on hillsides in Preservation Districts or State Conservation Districts which surround urban Honolulu. To expedite construction and to reduce costs, most broadcasting towers are located in areas designated for urban development where these special permits are not required. In addition to tall towers built on the ground, several towers have been built on the rooftops of high buildings to improve broadcast coverage. These towers are important sources of radiofrequency (RF) radiation.

RF radiation is the signal from radio, television, microwave relays, satellite earth terminals, and other communications systems that transmit the program material. RF radiation (10 kilohertz to 100 Gigahertz), a part of the electromagnetic radiation spectrum, is called "non-ionizing" radiation; unlike ionizing radiation such as x-rays, it does not create charged particles (ions) in tissue.

On January 23, 1985, the U.S. Environmental Protection Agency (EPA) announced results of an environmental measurement survey of radiofrequency (RF) radiation levels in Honolulu (EPA, 1985). The study, conducted in May 1984 at the request of the Federal Communications Commission (FCC), measured levels of RF radiation at 21 locations in areas near virtually all radio and television broadcasting towers in Honolulu (Figure 1). Results indicated that public exposures in 12 out of the 21 survey locations exceeded the limits currently proposed, recommended, and/or adopted by several scientific and technical advisory organizations or regulatory bodies. Two sites surveyed (i.e., the "Kaimuki Tower" and the "Ala Wai Tower") exceeded the American National Standards Institute's recommended standard of 1,000 microwatts per square centimeter (uW/cm^2).

In the EPA survey, measurements were made only in areas near antennas at locations where public exposures to RF radiation are believed to be highest (EPA, 1985). Results showed field intensities dropped off rapidly with distance from the towers. In general, beyond about 100-150 feet from the base of towers, exposure was below 100 uw/cm^2. The highest levels measured in this survey (up to 24,000 uW/cm^2) were outdoors in close proximity to the towers, on rooftops, or in areas with access normally limited to maintenance personnel or other workers. In these areas, exposures may be characterized as transient or intermittent, and few people are likely to be exposed continuously. Indoor fields were generally low because of shielding by the walls, glass and roofs of buildings (1 - 50 uW/cm^2).

For comparison, EPA has conducted a series of measurement studies throughout the U.S. It was found that less than one percent of the population is potentially exposed to power

densities above 1 uW/cm^2 (EPA, 1985). Exposure below 1 uW/cm^2 are typical for individuals who live far from major sources and exclude exposures for individuals living or working in close proximity to RF radiation sources.

EPA officials have repeatedly stated that they do not believe that the levels of RF radiation measured at the Honolulu sites pose an immediate risk to the public (Tell, 1975; Cannon, 1985; EPA, 1985). However, they do not comment on long-term health effects. They stress that the FCC should investigate the extent to which people are exposed to areas with the highest fields. Cannon (1985) suggested that the FCC should at least consider evaluating the two publically accessible locations where the measured exposure levels exceed 1,000 uW/cm^2.

In April, 1985, Melton (1985) conducted a questionnaire survey of residents of three condominiums adjacent to the Ala Wai Tower to ascertain the extent of "phenomena" reported by residents in the area. Residents surveyed reported disruptive interference affecting their electronic entertainment equipment, communication systems, and other electrical appliances. A variety of other phenomena were also reported, such as music playing from non-electrified metal objects. Of the 157 residences reporting phenomena, 82 (53%) generally associated the phenomena with RF radiation from the Ala Wai tower. Comments indicated their aggravation over the various nuisance effects, concern that RF radiation will also cause health problems, and belief that the tower has negative effect on their property values.

The health effects associated with high levels of exposure (1-4 W/kg) are due to heating of cells and tissues in the body. The actual level of the increase in body temperature depends on the duration and level of exposure, and on the body's ability to dissipate heat. Effects have also been found in experimental animals at levels that do not produce detectable temperature increases in tissues. To date, non-thermal effects have been poorly studied in animals (most studies use experimental animals exposed for relatively short periods, rather than long-term continuous exposures) and few epidemiologic studies of humans have been conducted.

Long-term, low-level exposure to RF radiation (0.4 W/kg) has been associated with enlarged adrenal glands and an increase in overall tumor incidence in rats, although there was no statistically significant increase in any particular type of tumor (EPA, 1984). Other effects, such as enhancement of the efflux of calcium ions from animal brain tissue, have been found in experimental animals as lower exposure levels that do not produce detectable temperature changes in tissue, but it is not known whether these effects occur in humans or if they are harmful.

Non-thermal effects in humans are not well-defined. Some investigators have reported a high incidence of cancer among workers exposed to electric equipment, microwaves and

radiofrequency energy, others have reported Down's Syndrome (a chromosomal abnormality) among children borne of exposed parents (EPA, 1984). Wertheimer and Leeper (1979) reported an apparent relationship between childhood leukemia and proximity to high-tension wires carrying high currents in Denver. In a similar study, Fulton et al. (1980) could find no relationship between leukemia and electric power line configurations in Rhode Island. Studies of the potential for RF radiation to induce or promote cancer in animals and humans are contradictory and inconclusive.

Burns and shocks resulting to the induction of electrical current have also been reported to be associated with RF radiation exposure at levels below those levels that induce a direct temperature change in tissues. The Division of Occupational Safety and Health, Hawaii State Department of Labor and Industrial Relations, reported window washers have received burns from metal cables supporting suspended platforms (DOSH, personal communication). Radiation-associated burns were also reported in the survey of nearby residents conducted by Melton (1985). In keeping with the World Health Organization's current definition of health, i.e., "A state of physical, mental and social well-being, not just the absence of disease ...," other factors besides the direct heating effects must be considered, such as nuisance effects and the potential for injury or fires.

Study Objective

The literature on possible adverse health effects of RF radiation suggests that humans continuously exposed may possibly be at increased risk of cancer. To explore this possibility, the objective of this study was to compare incidence rates of cancer in census tracts in Honolulu with broadcasting towers to selected census tracts on Oahu without broadcasting towers.

METHODS AND PROCEDURES

Data was obtained from the Hawaii Tumor Registry (HTR) for the years 1979 to 1983. The HTR is a joint effort by the State of Hawaii Department of Health, the Cancer Research Center of Hawaii, University of Hawaii, and the Hawaii Medical Association to register all newly diagnosed cases of cancer in the State. Squamous and basal cell carcinomas of the skin are the only cancers for which data are not collected. Cancer cases are identified from all hospitals in the State, private pathology laboratories, and searches of death certificates. While 94 percent of the cases reported to the HTR are microscopically confirmed, less than two percent are diagnosed exclusively from death certificates.

Data on nine (9) census tracts with broadcasting towers and two census tracts containing no broadcasting towers (Census tract 47 and 92 located in Nuuanu Valley and Wahiawa, respectively) were included in the analysis. Figures 2-4 in Appendix B show the age, sex and race distribution of these census tracts.

The expected number of cases for the different census tracts were computed from age- and race-specific rates for the State for the period 1979-1983. The ratio of observed to expected values, a summary statistic called the standard incidence ratio (SIR), was calculated and evaluated for significance using a method described by Nelder (1964). This method uses a 99 percent confidence interval of the SIR to determine statistical significance ($P<.01$).

RESULTS AND DISCUSSION

The observed incidence rate of all cancers for males and females was found to be significantly higher in census tracts with broadcasting towers than expected ($P<.01$) for the period 1979-1983 after adjusting for age (Tables 1-3). Males are found to have significantly higher rates than expected in all census tracts with broadcasting towers, with the exception of census tract number 36.02. Females have significantly higher rates in two census tracts.

In Hawaii, the main determinant of cancer incidence in a population, after its age, is its ethnic composition (Le Marchand, 1986). However, after adjusting for race, 8 out of 9 census tracts with broadcasting towers have higher rates of all cancers (Table 4).

Incidence rates for leukemia were not significantly higher ($P>.01$) than expected in census tracts with broadcasting towers or in control census tracts after adjusting for age and sex (Tables 1, 5-6). The small number of cases of leukemia prohibited simultaneous adjustment for age, sex and race.

It is noteworthy that one (1) of the control census tracts (Number 47) had a significantly higher rate of all cancers than expected after adjusting for race. This census tract had a large proportion of individuals over 45 years of age, which may explain this result. Incidence rates were not simultaneously adjusted for age, sex and race. The inclusion of additional census tracts would help to further define the range of SIRs that may be expected.

The ecologic design utilized does not allow the establishment of a cause-and-effect relationship between cancer incidence and exposure to low levels of RF radiation nor does it preclude the possibility that certain individuals may be at increased risk.

Ecological studies have several important limitations that must be recognized. First, data on the magnitude and duration of personal exposure is often unavailable or impossible to obtain. Accurate exposure data is essential for establishing a cause-and-effect relationship. Second, there may be a long latency period between exposure and the onset of cancer. Third, a low incidence rate in a small exposed population will be impossible to distinguish statistically from possible confounding effects. Fourth, individuals are exposed to a multiplicity of carcinogenic agents both at the workplace and in the home environment. Due to the wide variety of agents to which an individual is exposed, it is impossible to incriminate a particular agent or to demonstrate a causal relationship. Finally, the populations studied may be transient and exposure will, of course, vary from place to place. Prospective methods must be used in this situation. The use of person years of exposure is only a partial solution if the effects of long-term low-level exposure are being studied.

In this study, adequate exposure data was not available for showing a dose-response relationship. Residents in census tracts with broadcasting towers were assumed to be exposed to higher levels of RF radiation than controls residing in census tracts without broadcasting towers. Exposures outside of their place of residence and length of residence (i.e., duration of exposure) was not available from Hawaii Tumor Registry records, which makes it even more difficult to determine cumulative exposure. Data on various confounding factors which are known to affect cancer incidence (e.g. smoking, diet, and occupational history) were not available. The absence of this data makes any apparent differences in cancer incidence between census tracts difficult to interpret.

The major benefit to be gained from ecological studies is that they may indicate the need for more extensive, in-depth studies to be done. The results of this study and the lack of data in the scientific literature on possible long-term health effects associated with RF radiation (see the Introduction) indicates the need for more study.

Regulatory Standards and Guidelines

Currently, the only federal standards for RF radiation in the U.S. are the Occupational Safety and Health Administration (OSHA) standard (OSHA, 1971) for occupational exposure control and the Bureau of Radiological Health (BRH) microwave oven performance standard (FDA, 1972). The OSHA standard is 10,000 uW/cm^2 averaged over any 0.1 hour period and the BRH standard specifies that microwave ovens must not leak radiation exceeding a power density of 5,000 uW/cm^2 at any point two inches from the surface during the life time of the oven. These standards are either occupational exposure standards or product performance standards and are not applicable to continuous public exposures.

On June 12, 1986, the EPA proposed four alternatives for controlling public exposure to RF radiation from communication sources (EPA, 1986). Three of these alternatives are based primarily on limits recommended or adopted by various advisory groups such as the American National Standards Institute (ANSI), the National Council on Radiation Protection, and the International Radiation Protection Association (IRPA). The fourth alternative is a non-regulatory option; that is, "Conducting other activities in lieu of adopting federal guidance for RF radiation, such as establishing public awareness programs to distribute information on health effects and environmental measurements, and providing technical assistance to states and federal agencies."

The ANSI guidelines for continuous exposure limit broadcast power densities to 1,000 uW/cm^2. The ANSI voluntary standard is generally recommended by the broadcast industry as a safe level for continuous exposures. The IRPA, an organization charted by Congress, has drafted a standard for continuous

exposure which is five times lower than the ANSI standard, or 200 uW/cm^2.

The proposed regulatory alternatives would control RF radiation exposure in terms of limiting whole-body average specific absorption rates (SARs). The whole-body average SAR is the total power absorbed in the tissue of the body averaged over the body mass and is expressed in units of watts per kilogram of body mass (W/kg). All of the existing and proposed standards are predicated on the basis that exposures that result in whole-body average SARs of 1-4 W/kg are harmful (EPA, 1986). This is the level at which body core temperature is reported to increase. The standards under consideration only differ in the size of the "safety factor" (or "uncertainty factor") used to obtain an acceptable exposure limit in an attempt to compensate for unknowns and uncertainties with regard to possible adverse health effects.

It is inappropriate to use a safety factor approach in regulating a potential human carcinogen because current methods in cancer risk estimation assume there is no threshold below which there will be no effect. Given the results of this study and others which indicate a possible relationship between RF exposure and cancer, it would be most appropriate to use a cancer-risk extrapolation model based on data from animal experiments to derive an acceptable level of exposure if dose-response data is available.

There are no State or county standards to control public exposures to RF radiation in Hawaii. Therefore, the Hawaii State Department of Health does not have statutory authority over sources of non-ionizing radiation at present.

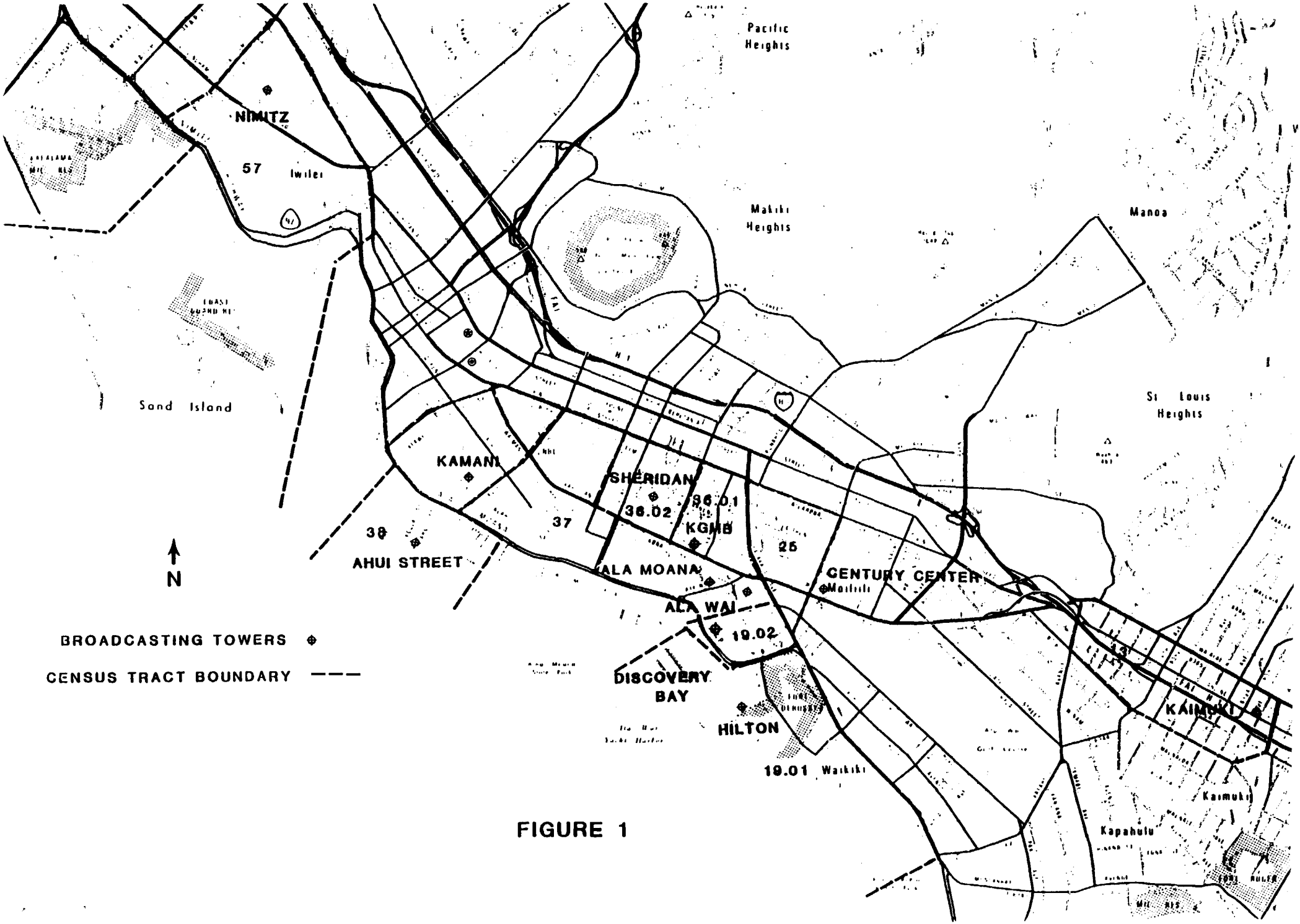
The State of Massachusetts has adopted the IRPA standard (200 uW/cm^2, which corresponds to limiting whole body average SARs to 0.04 W/kg for frequencies above 3 Mhz). Portland, Oregon, has established a more stringent standard of 100 uW/cm^2. While other localities have established RF radiation standards, these represent the ranges of standards adopted or under consideration in the U.S.

Recommendations

Ecological studies of populations where exposures cannot be well-defined are unlikely to be productive in further defining adverse health effects that may be associated with RF radiation. However, the results of this study do suggest the need for additional research.

Populations at high risk where exposure can be more accurately estimated or measured (e.g, those in close proximity to the Lualualae and/or the Haiku RF radiation fields) should be studied utilizing a rigorous case-control approach. The results of such studies can then be extrapolated to other populations (e.g., those in close proximity to commercial broadcasting towers) for the purpose of evaluating cancer risk.

Until more information is available on possible long-term effects of RF radiation, it is recommended that an interim standard for public exposure to RF radiation be adopted to protect the public health. A standard can be an effective regulatory tool if appropriate funding and resources for monitoring and enforcement are made available.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Sand Island
St Louis Heights
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AHUI STREET
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CENTURY CENTER
ALA MOANA
ALA WAI
19.02
DISCOVERY BAY
HILTON
19.01
Waikiki
KAIMUKI
Kaimuki
Kapahulu
N
BROADCASTING TOWERS
CENSUS TRACT BOUNDARY

FIGURE 1

TABLE 1

AGE-ADJUSTED INCIDENCE RATES OF ALL CANCERS AND LEUKEMIA
IN CENSUS TRACTS WITH BROADCASTING TOWERS
AND SELECTED CENSUS TRACTS WITHOUT BROADCASTING TOWERS,
HONOLULU, HAWAII, 1979 - 1983

Census Tracts	Males		Females	
	Incidence (per 100,000)	SIR[a]	Incidence (per 100,000)	SIR
All Site Cancers:				
With towers	2198	1.45*	1843	1.27*
Without towers	1590	1.05	1234	0.85
Leukemia:				
With towers	76	1.58	38	1.45
Without towers	12	0.27	25	0.97

[a]SIR (Standard Incidence Ratio) = $\frac{\text{Number of Cases Observed}}{\text{Number of Cases Expected}}$

* Statistically significant ($P<.01$)

TABLE 2

AGE-ADJUSTED INCIDENCE RATES OF ALL CANCERS FOR MALES
IN CENSUS TRACTS WITH BROADCASTING TOWERS
AND SELECTED CENSUS TRACTS WITHOUT BROADCASTING TOWERS,
HONOLULU, HAWAII, 1979 - 1983

Census Tract	Number of Cases Observed	Number of Cases Expected	SIR[a]	Adjusted Incidence Rate (per 100,000)
With Broadcasting Towers:				
13	147	49	3.00*	4543
19.01	30	11	2.62*	3967
19.02	106	56	1.89*	2857
25	54	40	1.35*	2034
36.01	52	34	1.51*	2285
36.02	22	28	0.79	1199
37	34	18	1.88*	2843
38	11	4	2.65*	4009
57	32	18	1.77*	2687
Total	488	336	1.45*	2197
Without Broadcasting Towers:				
47	67	52	1.30	1976
92	68	76	0.89	1340
Total	135	129	1.05	1589

[a]SIR (Standard Incidence Ratio) = $\frac{\text{Number of Cases Observed}}{\text{Number of Cases Expected}}$

* Statistically significant ($P<.01$)

TABLE 3

AGE-ADJUSTED INCIDENCE RATES OF ALL CANCERS FOR FEMALES IN CENSUS TRACTS WITH BROADCASTING TOWERS AND SELECTED CENSUS TRACTS WITHOUT BROADCASTING TOWERS, HONOLULU, HAWAII, 1979 - 1983

Census Tract	Number of Cases Observed	Number of Cases Expected	SIR[a]	Adjusted Incidence Rate (per 100,000)
With Broadcasting Towers:				
13	111	50	2.23*	3244
19.01	39	26	1.49	2170
19.02	77	71	1.09	1588
25	47	47	0.99	1441
36.01	60	67	0.90	1309
36.02	16	25	0.65	941
37	48	32	1.51*	2191
38	8	4	2.12	3077
57	11	8	1.33	1937
Total	417	328	1.27*	1842
Without Broadcasting Towers:				
47	54	59	0.90	1310
92	49	61	0.80	1159
Total	103	121	0.85	1233

[a]SIR (Standard Incidence Ratio) = $\frac{\text{Number of Cases Observed}}{\text{Number of Cases Expected}}$

* Statistically significant ($P<.01$)

TABLE 4

RACE-ADJUSTED INCIDENCE RATES OF ALL CANCERS
IN CENSUS TRACTS WITH BROADCASTING TOWERS
AND SELECTED CENSUS TRACTS WITHOUT BROADCASTING TOWERS,
HONOLULU, HAWAII, 1979 - 1983

Census Tract	Number of Cases Observed	Number of Cases Expected	SIR[a]	Adjusted Incidence Rate (per 100,000)
With Broadcasting Towers:				
13	258	86	3.00*	4459
19.01	69	26	2.62*	3893
19.02	183	97	1.89*	2804
25	101	75	1.35*	1997
36.01	112	74	1.51*	2243
36.02	38	48	0.79	1177
37	82	44	1.88*	2791
38	19	7	2.65*	3935
57	43	24	1.78*	2638
Total	905	481	1.88*	2792
Without Broadcasting Towers:				
47	121	92	1.31*	1940
92	117	132	0.89	1315
Total	238	222	1.07	1591

[a]SIR (Standard Incidence Ratio) = $\frac{\text{Number of Cases Observed}}{\text{Number of Cases Expected}}$

* Statistically significant ($P<.01$)

TABLE 5

AGE-ADJUSTED INCIDENCE RATES OF LEUKEMIA FOR MALES
IN CENSUS TRACTS WITH BROADCASTING TOWERS
AND SELECTED CENSUS TRACTS WITHOUT BROADCASTING TOWERS,
HONOLULU, HAWAII, 1979 -1983

Census Tract	Number of Cases Observed	Number of Cases Expected	SIR[a]	Adjusted Incidence Rate (per 100,000)
With Broadcasting Towers:				
13	2	1.5	1.36	63.0
19.01	1	0.7	1.42	65.8
19.02	0	1.0	--	--
25	2	1.2	1.70	78.5
36.01	2	1.5	1.37	63.6
36.02	2	0.7	2.88	133.5
37	5	0.9	5.39*	249.6
38	0	0.0	--	--
57	1	0.6	1.58	73.0
Total	15	9.1	1.65	76.2
Without Broadcasting Towers:				
47	0	1.0	--	--
92	1	2.0	0.50	23.1
Total	1	3.0	0.27	12.5

[a]SIR (Standard Incidence Ratio) = $\frac{\text{Number of Cases Observed}}{\text{Number of Cases Expected}}$

* Statistically significant (P<.01)

TABLE 6

AGE-ADJUSTED INCIDENCE RATES OF LEUKEMIA FOR FEMALES
IN CENSUS TRACTS WITH BROADCASTING TOWERS
AND SELECTED CENSUS TRACTS WITHOUT BROADCASTING TOWERS,
HONOLULU, HAWAII, 1979 - 1983

Census Tract	Number of Cases Observed	Number of Cases Expected	SIR[a]	Adjusted Incidence Rate (per 100,000)
With Broadcasting Towers:				
13	2	0.9	2.34	61.2
19.01	1	4.5	0.22	5.8
19.02	2	1.1	1.75	45.9
25	1	0.8	1.27	33.3
36.01	2	1.1	1.74	45.7
36.02	0	0		
37	0	0		
38	0	0		
57	0	0		
Total	8	5.5	1.45	38.1
Without Broadcasting Towers				
47	1	1.0	1.00	26.1
92	1	1.1	0.94	24.7
Total	2	2.1	0.97	25.4

[a]SIR (Standard Incidence Ratio) = $\frac{\text{Number of Cases Observed}}{\text{Number of Cases Expected}}$

* Statistically significant (P<.01)

TABLE 7

RACE-ADJUSTED INCIDENCE RATES OF LEUKEMIA
IN CENSUS TRACTS WITH BROADCASTING TOWERS
AND SELECTED CENSUS TRACTS WITHOUT BROADCASTING TOWERS,
HONOLULU, HAWAII, 1979 - 1983

Census Tract	Number of Cases Observed	Number of Cases Expected	SIR[a]	Adjusted Incidence Rate (per 100,000)
With Broadcasting Towers:				
13	4	2.0	2.01	73.4
19.01	2	0.6	3.28	119.8
19.02	2	2.3	0.89	32.4
25	3	1.7	1.78	65.1
36.01	4	1.7	2.38	86.8
36.02	2	1.1	1.86	67.9
37	5	1.0	4.95	180.5
38	0	0	--	--
57	1	0.6	1.69	61.8
Total	23	11.1	2.08	76.0
Without Broadcasting Towers				
47	1	2.1	0.48	17.6
92	2	3.1	0.65	23.8
Total	3	5.1	0.59	21.5

[a]SIR (Standard Incidence Ratio) = $\frac{\text{Number of Cases Observed}}{\text{Number of Cases Expected}}$

* Statistically significant (P<.01)

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